We Claim:

1. A dispersion and dispersion slope compensating optical waveguide fiber comprising:

a core region surrounded by and in contact with a clad layer, said core region including three segments, a central segment and a first and a second annular segment surrounding said central segment, each said segment having respective radii, r_i, relative refractive index percents, $\Delta_i\%$, where i takes on values 1, 2, and 3 beginning with 1 for the central segment, and refractive index profiles; wherein,

$\Delta_1\%$ is greater than 1.4%, r_1 is less than 3 μm;

$\Delta_2\%$ is more negative than -0.3%, r_2 is greater than 6 μm;

$\Delta_3\%$ is greater than 0.15%, r_3 is greater than 9 μm;

$\Delta_1\%$ is greater than $\Delta_3\%$, r_3 is greater than r_2; and,

the combination of $\Delta_i\%$'s and r_i's is selected to provide a negative total dispersion slope and a ratio of total dispersion to total dispersion slope in the range of 40 nm to 60 nm at a wavelength of 1550 nm.

2. The compensating optical waveguide fiber of claim 1 wherein;

$1.4\% \leq \Delta_1\% \leq 2\%$, $1.5\ \mu m \leq r_1 \leq 3.0\ \mu m$;

$-0.3\% \leq \Delta_2\% \leq -0.45\%$, $6.0\ \mu m \leq r_2 \leq 8.0\ \mu m$; and,

$0.15\% \leq \Delta_3\% \leq 0.85\%$, $9\ \mu m \leq r_3 \leq 12.0\ \mu m$.

3. The compensating waveguide of either one of claims 1 or 2 wherein attenuation at 1550 nm is less than 0.60 dB/km and total dispersion slope is more negative than -1.5 ps/nm^2-km at 1550 nm.

4. The compensating optical waveguide fiber of either one of claims 1 or 2 further including a first and a second clad layer, said first layer being nearer t the core region, each said layer having respective radii, r_{cj}, relative refractive index percents, $\Delta_{cj}\%$, where j takes on values 1 and 2, the value 1 corresponding to an inner clad layer and the value 2 to an outer clad layer, wherein;

$\Delta_{c1}\% < \Delta_{c2}\%$, $r_{1c} > 22$ μm, and the difference between $\Delta_{c2}\%$ and $\Delta_{c1}\%$ is less than or equal to 0.1%.

5. The compensating optical waveguide fiber of claim 4 wherein r_{1c} has a range from 25 μm to 35 μm and the difference between $\Delta_{c1}\%$ and $\Delta_{c2}\%$ has a range from 0.05% to 0.08%.

6. The compensating optical waveguide fiber of claim 5 wherein both cut off wavelength and zero dispersion wavelength are less than or equal to 1525 nm.

7. The compensating optical waveguide fiber of claim 6 wherein attenuation at 1550 nm is less than 0.60 dB/km and total dispersion slope is more negative than -1.5 ps/nm^2-km at 1550 nm.

8. A total dispersion and total dispersion slope compensated optical waveguide fiber span comprising;

a first length L_1 of optical waveguide fiber having, at 1550 nm, a positive total dispersion and total dispersion slope;

a second length L_2 of optical waveguide fiber having, at 1550 nm, a negative total dispersion and negative total dispersion slope, said second length optically coupled in series arrangement with said first length; wherein,

the ratio of total dispersion to total dispersion slope, at 1550 nm of said first and second lengths are equal to each other to within 5%, the ratio of the first length to the second length is not less than 35, and the end to end total dispersion of said span has a pre-selected value at 1550 nm.

9. The compensated span of claim 8 wherein the pre-selected end to end total dispersion at 1550 nm is zero and the local total dispersion along said span has a magnitude greater than or equal to 1.0 ps/nm-km.

10. The compensated span of claim 8 wherein the ratio of total dispersion to total dispersion slope at 1550 nm for both said first and second optical waveguide fiber lengths have a range from 40 nm to 60 nm.

11. The compensated span of claim 8 wherein said second length of optical waveguide fiber includes a core region surrounded by and in contact with a clad layer, said core region including three segments, a central segment and a first and a second annular segment, each said segment having respective radii, r_i, relative refractive index percents, $\Delta_i\%$, where i takes on values 1, 2, and 3 beginning with 1 for the central segment, and a refractive index profile; wherein,

$\Delta_1\%$ is greater than 1.4%, r_1 is less than 3 μm;

$\Delta_2\%$ is more negative than -0.3%, r_2 is greater than 6 μm;

$\Delta_3\%$ is greater than 0.15%, r_3 is greater than 9 μm;

$\Delta_1\%$ is greater than $\Delta_3\%$, r_3 is greater than r_2.

12. The compensated span of claim 11 wherein said second optical waveguide fiber length has core segment values:

$1.4\% \leq \Delta_1\% \leq 2\%$, $1.5\ \mu m \leq r_1 \leq 3.0\ \mu m$;

$-0.3\% \leq \Delta_2\% \leq -0.45\%$, $6.0\ \mu m \leq r_2 \leq 8.0\ \mu m$; and,

$0.15\% \leq \Delta_3\% \leq 0.85\%$, $9\ \mu m \leq r_3 \leq 12.0\ \mu m$.

13. The compensated span of claim 12 wherein said second length of optical waveguide fiber further includes a first and a second clad layer, each said layer having respective radii, r_{cj}, relative refractive index percents, $\Delta_{cj}\%$, where j takes on values 1 and 2, the value 1 corresponding to an inner clad layer and the value 2 to an outer clad layer, wherein;

$\Delta_{c1}\% < \Delta_{c2}\%$, $r_{1c} > 22\ \mu m$, and the difference between $\Delta_{c2}\%$ and $\Delta_{c1}\%$ is less than or equal to 0.1%.

14. The compensated span of claim 13 wherein said second length of optical waveguide fiber has, at 1550 nm, a slope more negative than -1.5 ps/nm^2-km, an attenuation less than 0.60 dB/km, and a cut off wavelength less than 1525 nm.